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(54) Abstract Title
Labware with memory storage

(57) Labware for processing and storing samples e.g. a tissue slide or cassette, has a micro module with a memory medium for information storage and an interface connecting the module with a read/write device. The interface may be an antenna or electrical contacts. The interface may be printed on the surface of a slide with conductive ink.

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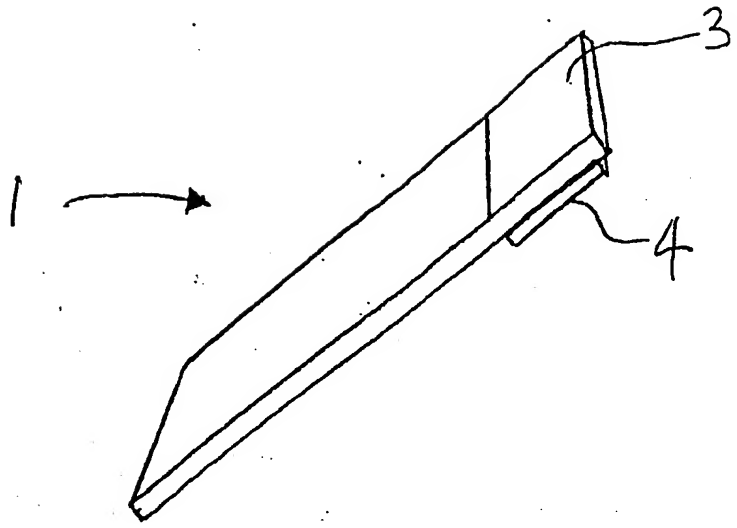

FIG. 1

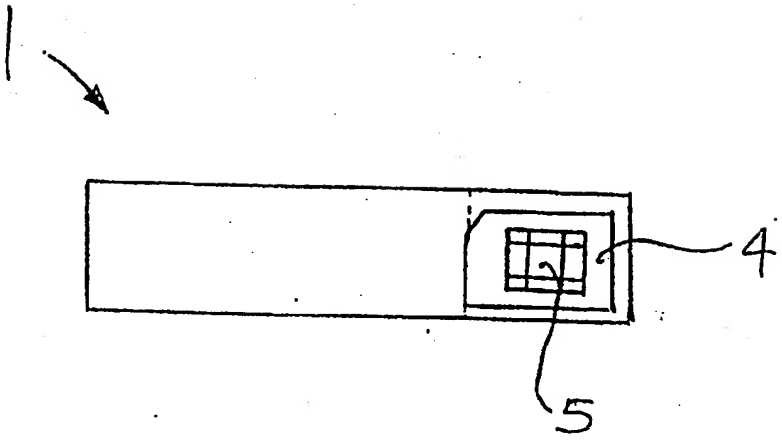

FIG. 2

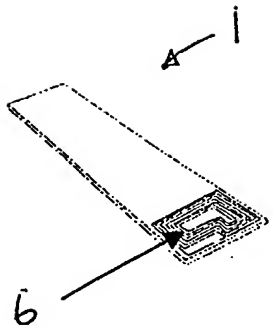

Figure 3

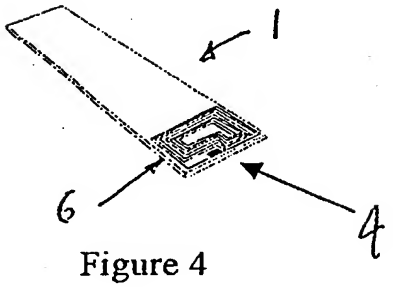

Figure 4

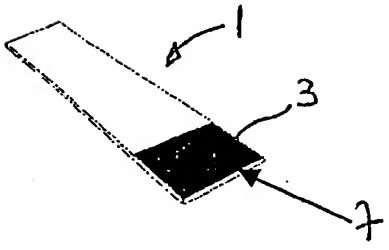

Figure 5

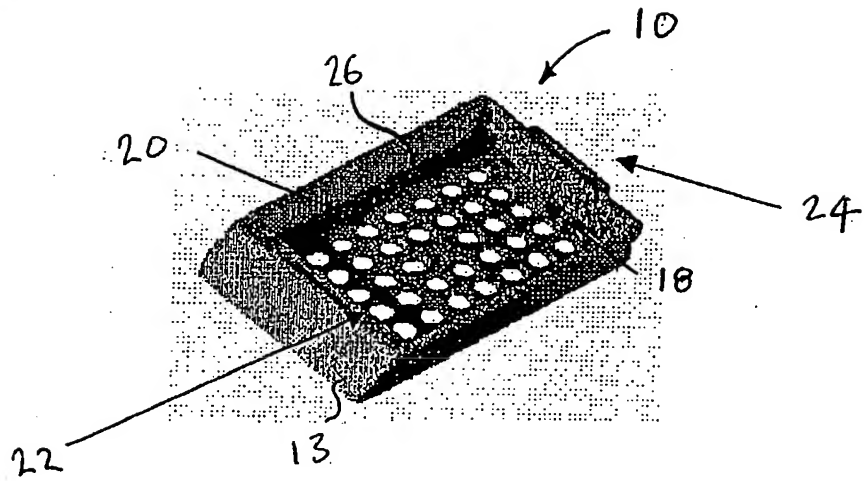

Figure 6

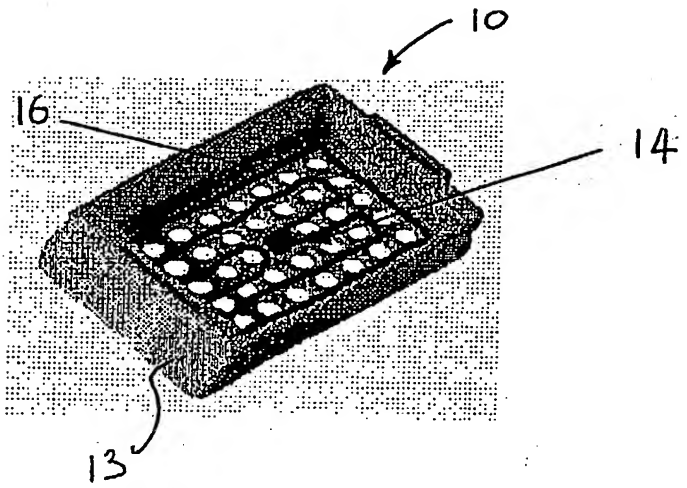

Figure 7

LABORATORY MOUNTING, STORAGE AND PROCESSING MEMBERS

The present invention relates to laboratory slides, tissue processing cassettes or trays, dishes and other like laboratory receptacles for mounting processing and storing laboratory samples. More particularly, the invention is concerned with enhancing the provisions on such receptacles for storing information identifying the receptacles and relevant to the accompanying samples.

A glass laboratory slide is a typical example of a laboratory receptacle which is used for mounting, and storing samples in a laboratory. The slides are normally marked by either writing, applying a printed label, scratching or engraving so as to uniquely identify them. A problem with this technique is that it is easy wrongly to identify the slide or misread the information on it. Also, once the slides are marked or labelled with information, it is very difficult to up-date or change the information. Furthermore, the amount of information that can be written or labelled on slides is very limited because the slides have relatively small surface areas. For example, the writing area on a standard laboratory slide is typically 25mm^2. Labelling the slide with machine readable bar codes could be an alternative method for applying more information on the slide but the lack of surface area on the slide still limits the amount of information that can be placed on the slide by this method.

A processing cassette is another example of a receptacle which is used in laboratories to store and carry tissue for analysis. The tissue is placed in a processing cassette and embedded in a block of wax or resin by depositing the wax or resin in the cassette. Like laboratory slides, tissue processing cassettes are typically marked by either writing or printing so as uniquely to identify them. In the latter case, printers are used to print text and bar codes on the cassettes. As with printing on laboratory slides, printing on cassettes is problematic in that it is easy wrongly to identify or misread the information and the print area is also quite small, approximately 7 x 28 mm, which limits the amount of text and the size of the bar code which can be used. Furthermore, coating the cassette with wax or resin during processing can lead to difficulty in reading the print making it even more likely that errors are not undetected.

It is an object of the present invention to alleviate the aforementioned problems.

According to one aspect, the present invention consists in a receptacle for mounting, processing or storing a laboratory sample including a micro module having a memory medium for storing information and an interface means for connecting the module to an electric or electronic read/write device.

The present invention has several advantages. By using a micromodule for storing information on the laboratory receptacle, significantly more information can be stored on the receptacle than by mere printing and without using more surface area. When it is desired to read from or write to the micromodule, the micromodule on the receptacle is connected, via the interface means, to an electronic read/write device which can read from or write to the memory of the micromodule. The invention therefore greatly reduces the risk of misreading or wrongly labelling receptacles. Also, a receptacle embodying the invention is ideal for use in laboratories because information can be easily added to the micromodule at any time, for example, as the receptacle progresses through the laboratory, which is difficult when using conventional marking techniques. Furthermore, the information can be stored with a higher level of security than with conventional methods because the information stored in the micromodule may only be accessed, updated or changed using the associated electronic read/write device.

Preferably, the memory medium of the micromodule stores information in a digital format. The interface means of the micromodule may comprise an antenna, which is connected to the micromodule. The micromodule may be adapted to communicate with the electronic reader/writer via the interface

means using either electromagnetic radiation, for example, infra red or radio frequency radiation, or an electric or magnetic field. This feature of the invention is particularly advantageous in that information can be read from or written to the memory of the micromodule without having physically to connect to the receptacle. Information can therefore be accurately read or written to the micromodule and there is no need to disturb the receptacle or even determine the exact location of it when reading from or writing to the micromodule during processing of the receptacle. Furthermore, information can be accurately read or written to the micromodule even if it is covered by wax or resin or any other material which is transparent to the electromagnetic radiation which is transmitted to and from the micromodule during processing of the receptacle. A wireless method of reading or writing information on a laboratory receptacle may be particularly useful when dealing with large batches of receptacles and receptacle carrying samples which should not, ideally, be disturbed.

Alternatively, the interface means of the micromodule comprises electrical contacts for electrically contacting the micromodule to the electronic read/writer.

The micromodule may also include write-protecting means for preventing the or another electronic writer/reader from altering the information stored in the

memory medium.

Conveniently, the interface means may be printed on a surface of the receptacle. The micromodule may be disposed at one end of the receptacle and may be surface mounted to a face of the receptacle or formed in the receptacle, itself. The micromodule may be a reusable module which is removeably attached to the receptacle. A writing surface necessary for printing or writing may be provided on a face of the receptacle at the same end as that on which the micromodule is located. If the micromodule is a contactless device, it may, itself, serve to provide a writing surface on the receptacle. In a preferred embodiment, the micromodule and interface means are juxtaposed on the same surface of the receptacle. Desirably, the interface means and, additionally or alternatively the micromodule, may be overprinted with protective ink so as to conceal the interface means and/or module. This feature of the present invention avoids the need to provide labels embedded with a micromodule and interface means which may be applied to the receptacle.

The electronic read/write device may be incorporated in a printer having printing means for printing text on the receptacle. The electronic read/write device reads from or writes to the micromodule on the receptacle, or if the micromodule is removed from the receptacle, from the micromodule only,

and has an interface means for connecting the read/write device to the micromodule.

Preferably, the electronic read/writer device may be arranged in a printer so that when the receptacle, fitted with the micromodule, is loaded into the printer, the electronic read/writer device interfaces with the micromodule to enable information to be read from or written to the micromodule whilst the receptacle is loaded in the printer and, if appropriate, whilst the printer is printing text on the writing surface of the receptacle.

In one embodiment, the micromodule is of the kind used in smart card technology, such as a RFID or MIFARE type tag, which operates in a contactless mode. The micromodule comprises a micro-transceiver and an integrated circuit, such as a single in-line memory module (SIM), and the memory of the integrated circuit is of the kind which is re-writable, such as an electrically erasable programmable read-only memory (EEPROM), so that information in the memory can be written over or erased by new information which is subsequently written to the memory using the electronic read/write device. Accordingly, a micromodule which is removably attached to a receptacle can be removed from the receptable and the information stored in the memory of integrated circuit can be erased to enable the micromodule to be reused on another receptacle.

Embodiments of the present invention will now be described, by way example, with reference to the accompany drawings, in which:-

Figure 1 is a perspective view of a slide embodying the present invention,

Figure 2 is a plan view of the slide of Figure 1 as seen from behind,

Figure 3 is a perspective view of a slide showing an antenna printed on a face at one end of the slide,

Figure 4 is a perspective view of the slide of Figure 3 and with a micromodule disposed adjacent the antenna,

Figure 5 is a perspective view of the slide of Figure 4, with the micromodule and antenna overprinted with protective ink,

Figure 6 is a perspective view of a known cassette , and

Figure 7 is a view of the cassette of Figure 6 embodying the present invention.

Referring to Figures 1 and 2 of the accompanying drawings, in one embodiment the receptacle is a glass laboratory slide 1 which has a micromodule 4 for storing information and a writing surface 3 for writing on or printing additional information. The micromodule 4 is surface mounted on one face, at one end of the slide 1, using an epoxy resin or a clip (not shown) for removably mounting the module, and the writing surface 3 is formed by know techniques on the opposite face, at the same end of the

slide 1.

The micromodule 4 comprises an integrated circuit, such as an single in-line memory module (SIM), and has electrical contact points 5 on its front surface which serve as an interfacing means for electrically interfacing the integrated circuit 4 to the circuit of a digital read/write device. The surface area of the slide 1 covered by the integrated circuit 4 is substantially the same as the writing surface area 3, that is 25 mm^2. The integrated circuit 4 enables significantly more information to be stored on the slide 1 without using more surface area than is conventionally used for printing or writing.

In order to read or write information on the integrated circuit 4, the slide 1, together with the integrated circuit 4, is inserted into a digital read/write device (not shown), such as a microprocessor, so as electrically to connect the integrated circuit 4, via its surface contacts 5, to a circuit of the digital read/writer. The digital read/write device can be used to transmit information, in digital form, from the digital read/write device to the integrated circuit 4 or from the integrated circuit 4 to the digital read/write device. The risk of misreading the information or incorrectly writing information on the slide 1 is significantly lower than with conventional slides.

The memory of the integrated circuit 4 is an EEPROM so that the information

stored on the memory can be erased or new information can be added to the memory using the digital read/write device. Information on the slide 1 can therefore be updated at any time using the digital read/write device, for example, as the slide 1 progresses through the laboratory. Also, the information stored on the slide 1 cannot be tampered with without using a digital read/write device which is specifically programmed to work with the integrated circuit 4. For added security, the integrated circuit 4 can be programmed with a password which must be entered into the digital write read device to allow information to be read from or written to the integrated circuit 4. Additionally, if the micromodule is removably mounted using the clip, it can be reused by unclipping it from the slide 1, erasing the information stored on the integrated circuit 4 using the digital read/write device and reapplying the micromodule to another or the same slide 1.

In another embodiment of the present invention, the interfacing means comprises an antenna 6 which is printed on one face at one end of slide 1 using conductive ink, as shown in Figures 3 and 4. The integrated circuit 4 is applied to the same face at the same end of the slide 1 and connected to the antenna 6 (see Figure 4). The surface area which is covered by the antenna 6 is substantially the same as a typical writing surface area of a standard slide, that is 25mm^2. The integrated circuit 4 and antenna 6 are overprinted with a protective ink 7 which protects and conceals them and which forms

the writing surface 3 of the slide as shown in Figure 5. The same printing process can therefore be used to over print the integrated circuit 4 and antenna 6 and provide a writing surface 3 to the slide 1. The present invention according to this embodiment removes the need to provide labels embedded with an integrated circuit 4 and antennas 6 which then have to be applied to the slide 1.

Figures 6 and 7 of the accompanying drawings, show another embodiment in which the receptacle is a tissue processing cassette 10 which has the micromodule, such as a contactless RFID or MIFARE type tag 14, for storing information, interface means in the form of an antenna 16 for interfacing the tag 14 to an electronic read/write device (not shown) and a writing surface 13 for writing on or printing additional information. The cassette 10 has a cavity 26 in one side such that the cassette forms a tray in which tissue can be placed. A lid (not shown) is hinged to one end 24 of the cassette 10 and includes a latching means for latching the lid to the opposite end 22 of the cassette so as to close off the opening of the cavity 26 during processing. A base 18 of the cassette 10 has perforations 20 which allow chemicals to flow freely into the cavity 26 during processing. The amount of surface area which can be used to affix the tag 14 and antenna 16 is therefore limited. The size of the antenna 16 is important as it determines the distance from which the tag 14 can be read from or written to the electronic read/write

device. The antenna 16 is therefore printed on the inside or back of the cassette 10, between and not over the perforations 20, using conductive ink. In this particular embodiment, the antenna 16 is printed on the base 18 of the cassette inside the cavity 26 and the tag 14 is fixed to the inside of the base using an epoxy resin. Alternatively, if the tag 14 is to be reused on another receptacle, it is fixed to the cassette by means of a clip (not shown). The antenna 16 and tag 14 are connected together and overprinted with a protective coating so as to protect and conceal them. The writing surface 13 is formed by known techniques on the front face, at the opposite end 22 of the cassette 10.

As in the previously described embodiment, the antenna 16 serves as an interfacing means for electrically interfacing the micromodule, in this case the tag 14, to the circuit of a digital read/write device. Information is written to or read from the tag 14 using the digital read/write device (not shown) and the information can be accurately read or written even if the tag 14 is coated with wax or resin during processing of the cassette.

As in the previously described embodiment, the digital memory of the micromodule is an EEPROM and the digital read/write device is specifically programmed to work with the tag.

The digital read/write device may be incorporated into a conventional printer for printing text on the tissue processing cassette 10. The digital read/write device is arranged in the printer so that it interfaces with the tag 14 of a cassette 10 which is loaded into the printer . The digital read/writer device can be used to read from or write to the tag 14 whilst the printer is printing text on the writing surface of the cassette 10.

It is not intended that the present invention be restricted to a laboratory receptacle having a micromodule comprising only an integrated circuit or tag and an antenna thereon as the interfacing means for connecting the micromodule to the electronic read/write device, as described herein. A skilled man would understand that the micromodule could comprise other kinds of micro devices and more than one integrated circuit or tag and that the interface means could alternatively comprise electrical contacts situated on the micromodule or receptacle, itself. When the electrical contacts are used, the micromodule can be electrically connected to the electronic read/writer via corresponding contacts on the electronic read/write device. Furthermore, the skilled man would know that laboratory receptacles other than slides and cassettes may embody the invention.

CLAIMS

1. A receptacle for mounting, processing or storing a laboratory sample including a micro module having a memory medium for storing information, and an interface means for connecting the module to an electric or electronic read/write device.

2. A receptacle as claimed in claim 1, wherein the interface means is an antenna or electrical contacts.

3. A receptacle as claimed in claim 1 or 2, wherein the interface means is printed on a surface of the receptacle.

4. A receptacle as claimed in claim 3, wherein the interface means is printed using a conductive ink.

5. A receptacle as claimed in any preceding claim, wherein the mircomodule is surface mounted.

6. A receptacle as claimed in any preceding claim, wherein the micromodule is removably mounted.

7. A receptacle as claimed in any preceding claim, wherein the interface means and micromodule are juxtaposed on the same surface of the receptacle.

8. A receptacle as claimed in any preceding claim, wherein the interface means and/or mircomodule are overprinted with a protective ink which conceals same.

9. A receptacle as claimed in claim 8, wherein the surface overprinted

with the protective ink serves as a writing surface.

10. A receptacle as claimed in any preceding claim, wherein the receptacle comprises a glass laboratory slide or cassette for processing tissue.

11. A receptacle as claimed in claim 10, wherein the cassette includes perforations and the interface means comprises an antenna which is printed on a surface of the cassette between said perforations.

12. A receptacle constructed and arranged as described herein with reference to Figures 1 and 2, Figures 3 to 5 or Figures 6 and 7 of the accompanying drawings.

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Application No: GB 0221152.2 **Examiner:** Michael R. Wendt
Claims searched: All **Date of search:** 27 November 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): G1B (BCN)

Int Cl (Ed.7): B01L 3/00

Other: Online: EPODOC, WPI, Japio

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2129551 A	(MOCHIDA) e.g. see Claims 1 - 8; page 2 lines 28 etc; page 4 line 2.	1, 3, 5 at least
X	EP 0875292 A1	(v der Maas) e.g. see Column 2 lines 1 etc & lines 44 etc.	1, 2
X,P	WO 02/26385 A1	(SGT) e.g. see Claim 1; page 3 lines 1 - 9; page 4 lines 14 - 18;	1, 2
X	WO 96/08433 A1	(CLIDS OY) e.g. see Figure 1; page 6 paragraph 1; Abstract.	1, 5
X	WO 89/08264 A1	(BALLIES) see Abstract.	1, 5
X	WPI Accession No: 2000 - 074308 & DE 29915334 U1 (SCHEUERMANN) see Abstract.		1, 2
X	WPI Accession No: 1996 - 189781 & EP 0706825 A (GRIEB) see Abstract.		1 at least
X	WPI Accession No: 1994 - 280525 & DE 4306563 A (LICHTENBERG) see Abstract.		1, 2

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Application No: GB 0221152.2 **Examiner:** Michael R. Wendt
Claims searched: All **Date of search:** 27 November 2002

Category	Identity of document and relevant passage	Relevant to claims
X	WPI Accession No: 1985 - 161173 & FR 2555744 A (PHILIPS) see Abstract.	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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